

## **Stormwater Analyst**

Performance Task

### **Introduction**

You are part of a team of Stormwater Analysts working with cities and towns in a watershed. You will need to help people understand what a rain garden is and how it can help absorb excess water and minimizing pollution in local rivers and streams. This task focuses on Earth Science and the movement and impact of water across an ecosystem.

### **Big Idea / Essential Questions**

#### **Big Idea**

- Aquatic, terrestrial, and human-made ecosystems consist of diverse living and non-living components that change over time and among geographic areas.
- Earth materials circulate in large-scale systems.
- People acting individually and/or as groups influence the environment.

#### **Essential Questions**

- How do ecosystems change over time?
- What causes the great variation at the Earth's surface?
- How do the actions of human impact the environment?

### **G.R.A.S.P.**

#### **Goal**

Your goal is to identify an area of a city or town that has stormwater runoff during a storm. You will want to identify an area that can possibly be a location for a rain garden. The creation of a rain garden will serve two purposes. First, it will help minimize stormwater runoff. Second, it can beautify the area and help keep nearby streams and/or rivers clean.

#### **Role**

You are part of a team of Stormwater Analysts working with cities and towns in a watershed. You will want to work with neighborhood residents and town/city leaders to identify areas that have excess stormwater runoff. You will need to help people understand what a rain garden is and how it can help absorb excess water and minimize pollution in local rivers and streams. Your hope is to help get them to agree to the creation of a rain garden in this area of excessive stormwater runoff.

#### **Audience**

Your audience will be neighborhood residents and city leaders who are concerned about excess stormwater runoff. They are concerned about the damage this water can do in the city/town and the pollutants that may enter the local river or stream within this stormwater. The audience will need to understand what a rain garden is, how it works, and why it should be considered to help reduce runoff.

## Situation

In many cities and towns a large part of the land is used to build houses, businesses and factories. With many of these structures driveways and parking lots are required. As towns and cities grow a number of roads are constructed linking the citizens around the town and to the towns beyond the community. As concrete, asphalt and other building materials replace green areas, stormwater moves quickly, often causing damage to the town infrastructure. This stormwater runoff also transports many pollutants to the local streams and/or rivers impacting the watershed.

## Products

### 1. Newscast

The local television station has asked your team to create a 1-2 minute news story that can be played on the local news and also be streamed on the websites of the town and television station. The station would like the news story to educate the viewers about the value of rain gardens and what a rain garden is.

The audience will need to understand how the garden can help control stormwater runoff and the entry of pollutants into local streams and rivers. They should also understand how this impacts the watershed and ecosystems downstream. Be sure to use visuals and diagrams to help the audience understand the importance of rain gardens.

- What are the value of rain gardens?
- How does the garden help control stormwater runoff?
- Why is rainwater runoff a potential concern for communities?

### Stormwater Analyst - Newscast

Achievement Levels	1	2	3	4
Informational Speaking (x1)	The presentation is constructed using little evidence emphasizing few important points.	The presentation is constructed using some relevant evidence presented in a somewhat coherent manner emphasizing important points.	The presentation is adequately constructed using evidence based upon research and presented in a coherent manner emphasizing important points to support an argument.	The presentation is thoroughly constructed using relevant evidence based upon research and presented in a coherent manner emphasizing important points to make a strong argument.
Graphics and Visuals (x1)	The graphics and visuals provide minimal evidence to support the claims made through the presentation and make the information provided easy for the viewer to understand.	The graphics and visuals provide some evidence to support the claims made through the presentation and make the information provided easy for the viewer to understand.	The graphics and visuals provide sufficient evidence to support the claims made through the presentation and make the information provided easy for the viewer to understand.	The graphics and visuals provide strong evidence to support the claims made through the presentation and make the information provided easy for the viewer to understand.
Cycling of Water	The product provides little evidence to explain the cycling of water through	The product provides some evidence to explain the cycling of water through	The product provides adequate evidence to explain the cycling of water through	The product provides strong evidence to explain the cycling of water through Earth's

Achievement Levels	1	2	3	4
<b>Human Society and Earth's Systems</b> (x1)	The product demonstrates minimal understanding of how human settlements can impact Earth's systems	The product demonstrates partial understanding of how human settlements can impact Earth's systems	The product demonstrates adequate understanding of how human settlements can impact Earth's systems	The product demonstrates strong understanding of how human settlements can impact Earth's systems
<b>Geoscience Processes and the Earth's Surface</b> (x1)	The product provides a minimal explanation based on evidence for how geoscience processes can change the Earth's surface.	The product provides some explanation based on evidence for how geoscience processes can change the Earth's surface.	The product provides a sufficient explanation based on evidence for how geoscience processes can change the Earth's surface.	The product provides a thorough explanation based on evidence for how geoscience processes can change the Earth's surface.

## 2. Model

Your team has been asked to construct a model of a rain garden to help the neighborhood residents and city leaders understand what it is made of and how it can help “trap” stormwater runoff. To create this model it may be best to use a flower pot that has holes in the bottom. The purpose of this model will be to show how much water is absorbed by the garden.

Your team will need to conduct research to learn about the important parts of a rain garden. Be sure to consider how the different components including the soil, roots, and plant tissues contribute to the capture of the stormwater. Once you have completed your research, you will be ready to build and test your rain garden. You may need to make adjustments to it if it does not absorb water. Good luck!

- What are the important parts of a rain garden?
- How do the different components contribute to the capture of the stormwater?

### Stormwater Analyst - Model

Achievement Levels	1	2	3	4
<b>Geoscience Processes and the Earth's Surface</b> (x1)	The product provides a minimal explanation based on evidence for how geoscience processes can change the Earth's surface.	The product provides some explanation based on evidence for how geoscience processes can change the Earth's surface.	The product provides an adequate explanation based on evidence for how geoscience processes can change the Earth's surface.	The product provides a thorough explanation based on evidence for how geoscience processes can change the Earth's surface.
<b>Cycling of Water</b> (x1)	The product provides minimal evidence for the cycling of water through Earth's systems.	The product provides some evidence for the cycling of water through Earth's systems.	The product provides adequate evidence for the cycling of water through Earth's systems.	The product provides strong evidence for the cycling of water through Earth's systems.
<b>Engineering Design</b> (x1)	The product provides minimal understanding through evidence of the design solution based upon the design problem and the factors that affect the problem.	The product provides partial understanding through evidence of the design solution based upon the design problem and the factors that affect the problem.	The product provides sufficient understanding through evidence of the design solution based upon the design problem and the factors that affect the problem.	The product provides strong understanding through evidence of the design solution based upon the design problem and the factors that affect the problem.
<b>Research and Model Development</b> (x1)	Product demonstrates that little research was conducted around the topic based upon the model constructed and its purpose.	Product demonstrates that some research was conducted around the topic based upon the model constructed and its purpose.	Product demonstrates that sufficient research was conducted around the topic based upon the model constructed and its purpose.	Product demonstrates that thorough research was conducted around the topic based upon the model constructed and its purpose.

## 3. Poster

Design a poster that explains what a rain garden is and how it can minimize the impact of stormwater runoff and the movement of pollutants in the water. You will need to use this poster to create a visual model to describe the cycling of Earth's materials and the flow of energy that drives this process.

Your poster should include a cross-section of a rain garden explaining the different layers of the rain garden and purpose of each including the different components of the soil mixture and the plants and shrubs selected and why these were chosen.

Finally, help people understand where the water comes from and how it moves through the rain garden. They will need to understand how the water moves downhill with gravity to other bodies of water. This poster will be very helpful for people who are trying to understand why a garden can be so important for stormwater management.

- What is a rain garden and how can it minimize the impact of stormwater runoff?
- What are the different layers of a rain garden?
- What are the different components of the soil mixture?

## Stormwater Analyst - Poster

Achievement Levels	1	2	3	4
<b>Engineering Design</b> (x1)	The product provides little understanding through evidence of the design solution based upon the design problem and the factors that affect the problem.	The product provides some understanding through evidence of the design solution based upon the design problem and the factors that affect the problem.	The product provides adequate understanding through evidence of the design solution based upon the design problem and the factors that affect the problem.	The product provides strong understanding through evidence of the design solution based upon the design problem and the factors that affect the problem.
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<b>Geoscience Processes and Earth's Surface</b> (x1)	The product provides a minimal description based on evidence for how geoscience processes can change the Earth's surface.	The product provides some description based on evidence for how geoscience processes can change the Earth's surface.	The product provides an adequate description based on evidence for how geoscience processes can change the Earth's surface.	The product provides a thorough description based on evidence for how geoscience processes can change the Earth's surface.
<b>Soil Layers</b> (x1)	The product demonstrates little understanding of soils and the materials that make up the soil and its characteristics.	The product demonstrates some understanding of soils and the materials that make up the soil and its characteristics.	The product demonstrates sufficient understanding of soils and the materials that make up the soil and its characteristics.	The product demonstrates strong understanding of soils and the materials that make up the soil and its characteristics.
<b>Graphics and Visuals</b> (x1)	The graphics and visuals provide little evidence to support the claims made through the presentation and make the information provided easy for the viewer to understand.	The graphics and visuals provide some evidence to support the claims made through the presentation and make the information provided easy for the viewer to understand.	The graphics and visuals provide adequate evidence to support the claims made through the presentation and make the information provided easy for the viewer to understand.	The graphics and visuals provide strong evidence to support the claims made through the presentation and make the information provided easy for the viewer to understand.
<b>Cycling of Earth Materials</b> (x1)	The product minimally describes the cycling of Earth's materials and the flow of energy that drives this process.	The product somewhat describes the cycling of Earth's materials and the flow of energy that drives this process.	The product creates an adequate model to describe the cycling of Earth's materials and the flow of energy that drives this process.	The product creates a thorough model to describe the cycling of Earth's materials and the flow of energy that drives this process.

## 4. Proposal

Your team will need to write a 1-2 page proposal explaining the importance of rain gardens. The proposal will be used by city leaders to help write grants to get money to build rain gardens around the town. The proposal should explain the value of rain gardens for the watershed and ecosystems downstream.

Be sure to explain how the soil, roots, and plant tissues contribute to the capture. It should share the benefits for the community, the communities downstream, and the neighborhood where it will be constructed.

- What is the importance of rain gardens?
- How do the soil, roots and plant tissues contribute to the rain capture?
- Why is rainwater runoff a potential concern for communities?

### Stormwater Analyst - Proposal

Achievement Levels	1	2	3	4
<b>Informational Writing</b> (x1)	The product is constructed using little evidence emphasizing few important points.	The presentation is constructed using some relevant evidence and presented in a mostly coherent manner emphasizing some important points	The presentation is adequately constructed using relevant evidence based upon research and presented in a coherent manner emphasizing important points	The presentation is thoroughly constructed using relevant evidence based upon research and presented in a coherent manner emphasizing important points
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<b>Structure and Function of Plants</b> (x1)	The product provides little evidence of how the structures of the plant are connected to various function and support growth and development.	The product provides some evidence of how the structures of the plant are connected to various function and support growth and development.	The product provides adequate evidence of how the structures of the plant are connected to various function and support growth and development.	The product provides strong evidence of how the structures of the plant are connected to various function and support growth and development.
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## 5. Rain Garden

If your team has the ability to create an actual rain garden, the first thing you will want

to do is identify a location somewhere in the city and town. Your team will want to consider the current use for the land, vegetation, slope and the closeness to buildings. Your garden can only hold so much water so choose an area that you can be successful. Areas in which the garden adds to the beauty of the area is always a good thing.

- What is a rain garden and how can it minimize the impact of stormwater runoff?
- What are the different layers of a rain garden?
- What are the different components of the soil mixture?

## Stormwater Analyst - Rain Garden

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